

Natural Capital Baseline Technical Report

June 2026



Contents

Introduction	2
Methodology	3
Key National Findings	5
Key Regional Findings	9
References	14
Appendix 1: Summary of Methodology by Ecosystem Service	16
Appendix 2: Accessible Figure Descriptions	18

Introduction

The Canal & River Trust cares for a national network of canals and towpaths, river navigations, docks and reservoirs, stretching for 2,000 miles (3,220 kms) across England & Wales. It manages and maintains historic assets, including aqueducts, embankments, bridges and tunnels, and provides green blue spaces and routes for people to use and to enjoy. The canal network plays a vital role in supporting water security, generating renewable energy, regulating urban temperatures, sequestering carbon and enhancing air quality. It also provides accessible spaces for recreation, contributes to physical and mental health and wellbeing, and creates opportunities for education, volunteering and community engagement. Together, these services demonstrate the key role of the canal network as nationally important infrastructure.

This report provides a systematic and consistent framework to measure the value of the natural assets that the Trust manages and is responsible for through a natural capital account baseline for the year 2023. This publication presents an initial application of that framework. Future updates will incorporate additional components (such as a natural capital balance sheet), consistent with Defra's Enabling a Natural Capital Approach (ENCA) guidance on a staged approach. Iteration will also enable the Trust to track changes and respond to emerging sustainability challenges.

The Trust's natural capital accounts follow Corporate Natural Capital Accounting (CNCA) guidance and include the following core components:

1. **Natural capital asset register:** An inventory of the stocks of the relevant natural capital assets (called habitats) and information regarding the condition of these assets.
2. **Physical flow account:** A record of the estimated flow of the goods and services (called ecosystem services) produced by the habitats specified in the asset register, measured in physical units.
3. **Monetary flow account:** A record of the value of the estimated flow of the goods and services (called ecosystem services) set out in the physical flow account. Value is measured with respect to both the private benefits of the organisation as well as the wider societal benefits. This is complemented with the value of the whole life of the Trust's natural capital.

The Trust's habitats deliver an annual value of £3.3 billion. Over a 100-year period, the estimated asset value is £99.2billion.

Recreation, tourism and health benefits account for around 90% of the total value of the Trust's natural assets. This is because the network is an important free and accessible blue-green space, with 9 million people living within a 10–15-minute walk of one of the Trust's canals.

From a regional perspective, London & South East's natural assets have the highest total value at £28.1billion due to the location of water transfer projects, a high urban cooling effect in a region that experiences the highest temperatures, high property prices that lead to higher amenity values, and the higher overall number of visits.

The natural capital monetary estimates presented in the report should be viewed as a partial value of the services provided by the Trust's natural assets, given that some services are less easy to fully quantify and value. Although biodiversity benefits are captured through the valuation of ecosystem services, the migration enabled through the connectivity dimension of the canal network may not be completely captured and it requires further research to be included. We are also aware that there are limitations in any natural capital valuation exercise. For example, we cannot capture relational, collective or intrinsic values.

The report delves into the natural dimension of waterways. However, the Canal & River Trust is aiming to develop an inclusive wealth framework that measures the holistic long-term social value delivered by the Trust's waterways. This means valuing the economic, environmental, social and cultural footprint of the canal network. The capital accounting approach will help to systematically show how waterways contribute to society wellbeing through the services they provide for people, communities and the nation.

It will also aid in identifying pressures and gaps in the funding required to maintain these assets in good condition so that their benefits are protected and future generations can also enjoy them.

Due to the overlap between different dimensions of value provided by waterways, the value attributed to the natural capital account may change in future iterations. For example, the overlap between the natural and culture & heritage dimensions of waterways mean that it is likely that part of the recreation value included in the natural capital account will be reattributed to the culture and heritage account. This is one of the emerging results of collaborative work we are developing with academics at the Economic Statistics Centre for Excellence and at University of Exeter.

We would like to thank AECOM for their support in the production of this report.

Methodology

Natural capital accounts (NCA) have been in development at the national level in the UK by the Office for National Statistics (ONS) since 2011. At the organisation level, the Natural Capital Committee developed guidance for Corporate Natural Capital Accounting (CNCA) in 2015. The Trust's natural capital account baseline adopts the CNCA approach. This natural capital account baseline initially focuses on the development of the asset register, the physical flow account and the monetary flow account. In further iterations, we plan to include the cost of maintenance to obtain a balance sheet with the net natural capital value.

The geographic boundary for the natural capital account follows the areas included in the Trust's Ecological Baseline. This includes:

- Land owned by the Trust.
- Land leased to others (owned by the Trust).
- Land leased by the Trust (under leasehold).
- Joint ventures if the Trust owns or leases land as part of this arrangement.

The Trust may contribute to the overall impact on habitats outside of this boundary. However, this is not measured in the baseline account.

A biodiversity footprint mapping and survey of the Trust's network was undertaken in 2023 to establish a comprehensive Ecological Baseline aligned with the Defra Biodiversity Metric. This combined high-resolution spatial mapping of habitats across all Trust landholdings - drawing on national datasets - with a programme of stratified random ground-truthing surveys to verify habitat type, location, and condition. Field survey data were then used to calibrate statistical models to predict habitat condition across the full estate, producing a consistent, network-wide baseline of habitat extent and quality. The Ecological Baseline has provided a foundation for the development of the natural capital accounts baseline asset register.

The findings are reported at a national and regional level. The Trust's regional boundaries are applied for the latter.

The reporting timeline is the financial year April 2023 – March 2024. The accounts include the annual value of the ecosystem service flows in 2023. In line with natural capital accounting guidance, a 100-year period is applied to quantify the present value of the flow of ecosystem

services. Future values are discounted according to recommended discount rates from the HM Treasury Green Book (2026).

The price year is the year to which all monetary values are standardised when calculating the value of natural capital (so that all values are reported in real terms). The price year is chosen to be 2023 to align with the 2023 Ecological Baseline. All prices are adjusted using the GDP deflator index to reflect their equivalent in 2023.

The ONS Principles of Natural Capital Accounting (2017a) paper recommends the use of exchange values to be consistent with national accounts (such as the ONS natural capital accounts). However, Defra ENCA (2023) guidance highlights that the use of exchange values is less essential for natural capital accounting at a corporate or local level and welfare values are typically used where this is the appropriate method. Welfare values are more suitable to capture social benefits and public good components of canals.

In cases where we could choose between valuation methods, we followed the hierarchy of economic valuation techniques for ecosystem services as defined by the UN's System of Environmental Economic Accounting – Ecosystem Accounting (SEEA EA) (UN et al., 2025; Ferrini et al., 2025). This meant that we applied the following prioritisation of methodology types:

1. Where the price is directly observable.
2. Where the price can be obtained from similar goods or services.
3. Where the price is embedded in an economic transaction (for example resource rent techniques or hedonic methods).
4. Based on costs for related goods or services (for example travel cost methods or cost-based approaches to meet an outcome).
5. That depend on expected expenditures (for instance avoided costs or replacements costs).
6. Other types of valuation methods.

An overview of valuation methods that are applied in the Trust's natural capital account is provided below. Please see Table 5 in Appendix 1 for the methodology used for each ecosystem service.

- **Market prices/ resource rents:** applies to goods and services that are traded, such as the market value of timber. In natural capital accounting, market prices can inform the calculation of resource rent which reflects the proportion of value attributable to the natural asset. The resource rent approach has been applied to value water provisioning and to renewable energy provisioning services.
- **Hedonic pricing:** environmental characteristics (such as a pleasant view) are reflected in property prices. The value of the environmental component can be revealed by isolating the contribution of the environmental characteristic on the price of the property. This method has been applied to value the aesthetic and recreation service.
- **Travel cost method:** uses the costs incurred by individuals taking a trip to a recreation site (transport costs, entry fees, opportunity cost of time) as a proxy for the recreational value of that site. This method has been applied to value the recreation (enjoyment benefits), tourism and education services.
- **Cost-based approaches:** use the costs of providing the environmental service as proxy values for the benefits. This method is applied to value the greenhouse gas regulating service.
- **Avoided costs:** prices are estimated in terms of the value of the damages that would arise if the service were reduced or did not exist. This technique has been applied to value the air pollution regulating, urban heat regulating and recreation (health cost savings) services.
- **Replacement costs:** prices reflect the estimated cost of replacing a service. This method has been applied to value the volunteering service.

We have undertaken a materiality assessment to identify the priority ecosystem services to include in the accounts. This has considered evidence (e.g. from internal Trust information and research) on

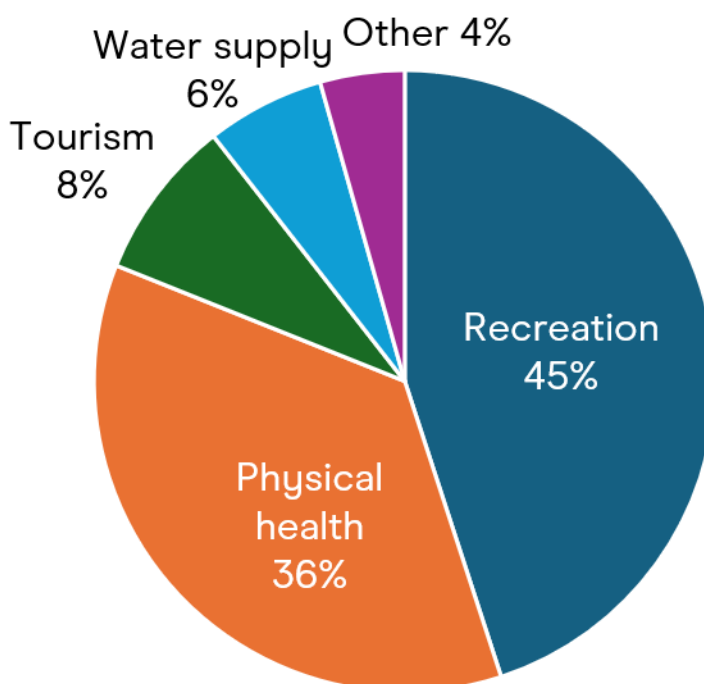
what ecosystem services provided are present and significant for waterways and whether the service provision is widespread across the Trust's network or more localised.

Key National Findings

The annual value of ecosystem services delivered by the natural capital assets under Trust management responsibility is £3.3billion. The total asset value is £99.2billion. See Table 1 for the estimated physical flow, monetary flow and asset value for each ecosystem service.

The large majority of the natural capital value comes from the recreational visits to the Trust's waterways and towpaths (£44.6 billion), domestic tourism visits (£8.3billion) and the health benefits from active visits (£35.8billion), accounting for 89% of the total value (see Figure 1).

Figure 1: Summary of breakdown of total natural capital asset value by ecosystem service in 2023.



The remaining 11% of asset value is delivered from a range of other ecosystem services. Water provided through transfer agreements with water companies is valued at £6.1billion², aesthetic and recreation (house prices) benefits are valued at £2.5billion, urban heat regulating benefits are valued at £1.1billion, volunteering benefits are valued at £0.34billion, greenhouse gas regulating benefits valued at £0.28billion, air pollution regulating benefits valued at £0.07billion, and education valued at £0.01billion.

The relatively high £1.1billion urban heat regulating asset value reflects the benefit that the canals in urban areas will deliver with increasing temperatures as a result of climate change. The cooling effect of the Trust's canals will become increasingly more valuable each year as temperatures rise over time.

² This doesn't include the Grand Union Canal Water Transfer Project. It will be included in the next iteration.

Table 1: Summary results for 2023 – Total organisational (England & Wales) (£millions, 2023 price year, annual and asset value over 100-year period)

Ecosystem service	Physical Flow (annual)	Units	Monetary Flow (annual) Millions (m)	Asset Value Millions (m)
Provisioning services				
Renewable energy provisioning	92,845	MWh	£1.76m	£52.46m
Water provisioning	276,488,000	m ³	£204.60m	£6,110.08m
Regulating services				
Air pollution regulating	9.96 (PM2.5), 8.16 (SO ₂), 3.36 (NO ₂), 213.66 (O ₃)	Tonnes	£1.21m	£65.92m
Greenhouse gas regulating	20,396	Tonnes	£5.79m	£279.00m
Urban heat regulating	N/A	N/A	£14.41m	£1,077.07m
Cultural services				
Recreation (enjoyment benefits)	389,100,082	visits (<3 hours, non-active, non-volunteer living >100m away)	£1,494.14m	£44,620.17m
Recreation (health cost savings)	323,095,712	active visits	£1,198.69m	£35,796.77m
Tourism	72,489,119	visits (3+ hours, non-active, non-volunteer living >100m away)	£278.36m	£8,312.71m
Aesthetic and recreation (house prices)	271,739	households living within 100 metres	£95.56m	£2,534.14m
Volunteering	715,198	volunteer hours	£11.33m	£338.31m
Education	93,399	hours of education	£0.45m	£13.50m
Total Value			£3,306.3m	£99,200.1m

Biodiversity

Biodiversity underpins the functioning of the Trust's natural assets and the services they provide. It refers to 'the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part' (Convention on Biological Diversity). In line with Corporate Natural Capital Accounting (CNCA) guidance, biodiversity is understood as a supporting function, enabling key ecological processes such as pollination, nutrient cycling, soil formation and disease regulation. These processes sit behind the delivery of provisioning, regulating and cultural services captured elsewhere in the accounts. To avoid double counting, biodiversity is therefore not typically assigned a standalone monetary value within natural capital accounts.

While not directly valued, biodiversity remains a critical component of the Trust's overall natural capital. Quantitative measures of habitat extent and condition - such as those derived from the Defra Biodiversity Metric - are incorporated within the asset register, providing an important indicator of the underlying ecological health of the network. Evidence from the Trust's baseline work and the *Vital Connector* report highlights the role of the canal network in supporting diverse habitats and species, particularly within landscapes that are otherwise fragmented or nature depleted.

As such, biodiversity should be understood as the foundation that enables and increases the productivity of many of the benefits reported in the accounts, rather than a separate value stream. Recognising and maintaining this underlying ecological function is essential to sustaining the long-term flow of ecosystem services provided by the network.

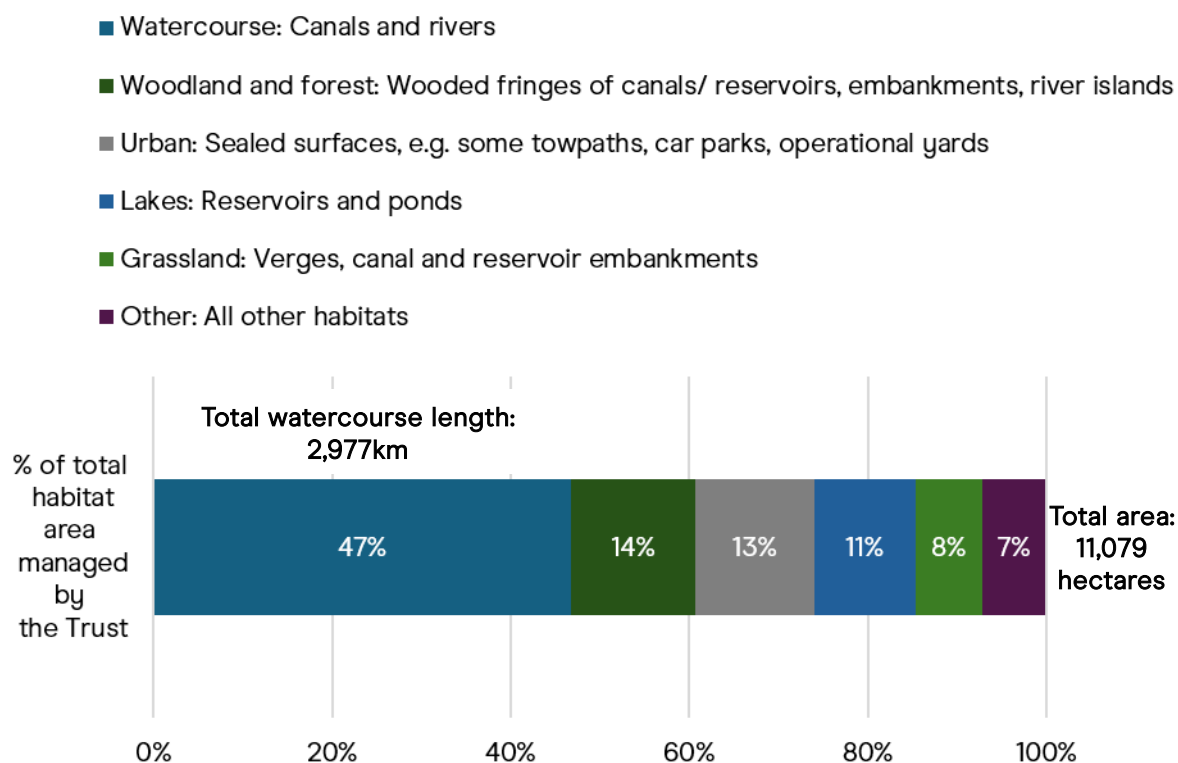
Natural asset connectivity

The Trust's canal network is one of the UK's most extensive systems of connected blue-green infrastructure, acting as a continuous biodiversity corridor through both urban and rural landscapes. As highlighted in the *Vital Connector* report, these waterways function as "living arteries" that reconnect fragmented habitats - supporting species movement, dispersal and genetic exchange. In doing so, they help underpin ecosystem resilience, particularly in parts of the country where natural habitats are otherwise isolated. Current guidance doesn't recommend including these system-level benefits within natural capital accounts due to the overlap with biodiversity benefits (which are not monetised because they are embedded across different ecosystem services) but they represent an important component of the value of the Trust's natural assets. This is an area of potential future research.

Asset Register

The Trust manages 2,977km of watercourses and 11,079 hectares of total land area across England and Wales. The watercourse footprint accounts for just under half of the total land area. Of the non-watercourse land area, this is mainly comprised of woodland and forest (14%), urban (13%) and reservoirs and pond (lakes) (11%) habitats (see Figure 2).

Figure 2: Summary of extent of habitats managed by the Trust in 2023.

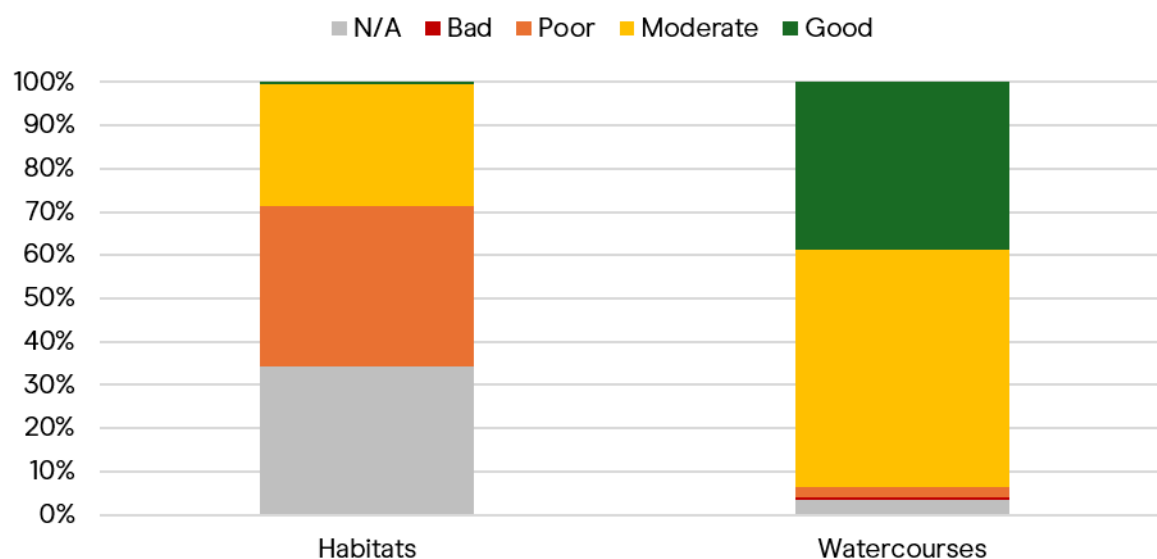


Within the 2023 ecological baseline, each parcel of land is given a condition score using the Defra Biodiversity Metric. For the non-watercourse land area, 0.3% of habitat area under Trust management responsibility are classified as being in 'Good' condition, with 28.3% and 37.1% of the natural assets in 'Moderate' and 'Poor' condition respectively; the remaining 34.2% of assets do not have a condition assessment³ (see Figure 3).

For the watercourse habitats, condition is assigned based on Water Framework Directive (WFD) Ecological Class. 38.8% of Trust-managed watercourses are classified as being in 'Good' condition, 54.9% as being in 'Moderate' condition, 2.4% being in 'Poor' condition, 0.4% being in 'Bad' condition, and the remaining 3.5% not having any WFD Ecological Class (see Figure 3).

³ This category predominantly includes Urban, Cropland, and Other habitat types.

Figure 3: Summary of condition of natural assets managed by the Trust in 2023. For Habitats this is measured using the Defra Biodiversity metric. For Watercourses this is measured using Water Framework Directive (WFD) Ecological Class.



Key Regional Findings

The Canal & River Trust operates within six self-defined regional boundaries: London & South East, Yorkshire & North East, East Midlands, North West, West Midlands, and Wales & South West.

There are large differences in the annual monetary flow and asset value between Trust regions in the baseline accounts. Table 2 shows that the natural capital value of the London & South East region (£28.1billion) is far larger than that of the other regions, driven primarily by recreation-related benefits and water provisioning. £4.8billion of the £28.1billion London & South East natural capital value is driven by water provisioning. This reflects the current pattern of existing water transfer arrangements, which may change over time.

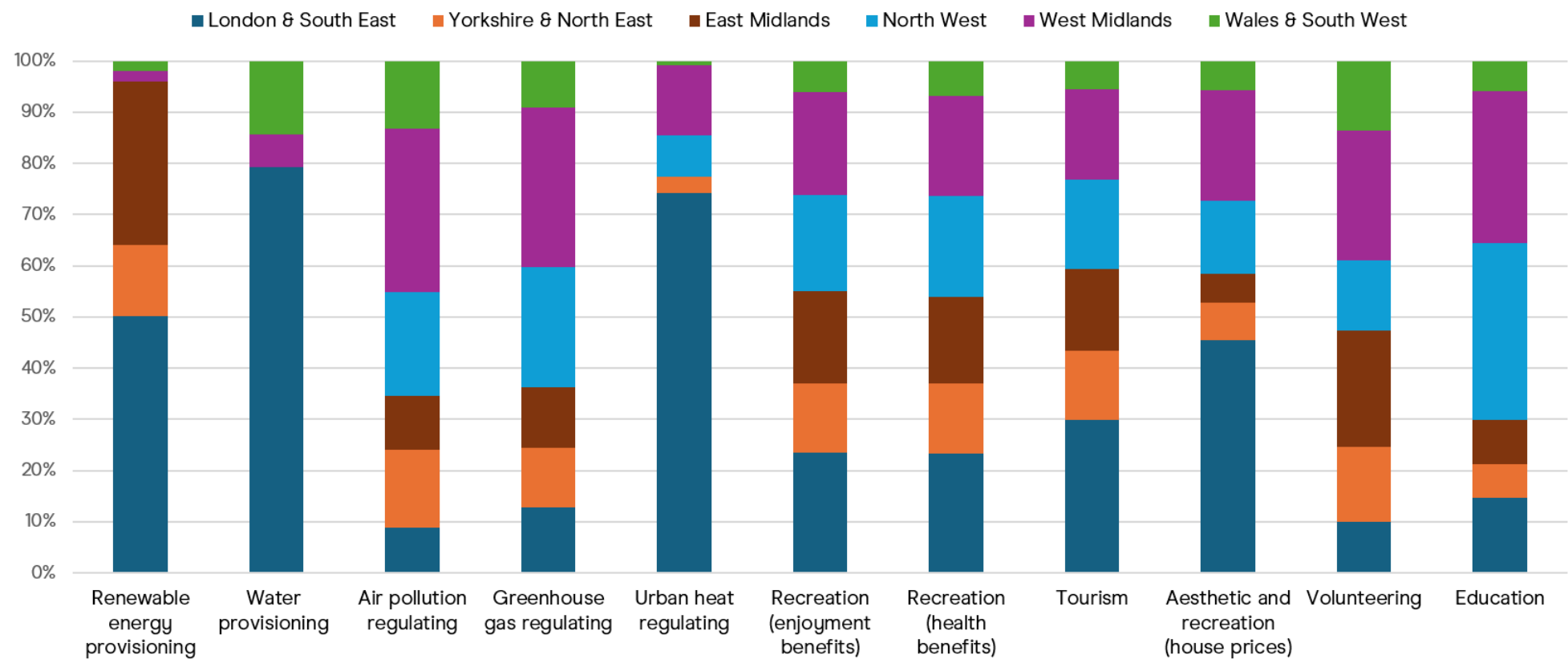
London & South East also delivers the majority of urban heat regulating benefits (£0.7billion of the total £1.1billion) across all regions, accounting for almost 65% of it. This service reduces the temperature of adjacent urban areas which in turn reduces the losses in labour productivity caused by hot days. This is due to the significant cooling effect generated by the London canal network and the large number of workers in London that may benefit from this cooling effect.

The Education benefits delivered by the North West and West Midlands regions are proportionally larger than for other regions. The Aesthetic and recreation (house prices) value delivered by the London & South East region are relatively higher than for other regions due to the large number of households in close proximity to a waterway and higher than average house prices in London. See Figure 4 for the relative contribution of region to the total monetary flow of each ecosystem service.

Table 2: Summary of breakdown of total natural capital asset value by Trust region in 2023 (£millions (m), 2023 price year, 100-year period).

Ecosystem service	Asset value					
	London & South East	Yorkshire & North East	East Midlands	North West	West Midlands	Wales & South West
Provisioning services						
Renewable energy provisioning	£26.27m	£7.30m	£16.75m	£0.08m	£1.03m	£1.03m
Water provisioning	£4,839.66m	£0.00m	£0.00m	£0.00m	£399.28m	£871.14m
Regulating services						
Air pollution regulating	£5.85m	£10.04m	£6.89m	£13.41m	£21.05m	£8.69m
Greenhouse gas regulating	£35.87m	£32.49m	£32.73m	£65.82m	£86.69m	£25.40m
Urban heat regulating	£695.03m	£68.97m	£0.00m	£147.85m	£155.38m	£9.83m
Cultural services						
Recreation (enjoyment benefits)	£10,537.59m	£5,992.93m	£8,122.08m	£8,354.54m	£9,006.00m	£2,731.57m
Recreation (health cost savings)	£8,309.06m	£4,919.19m	£6,084.89m	£7,041.05m	£6,959.08m	£2,474.62m
Tourism	£2,440.08m	£1,103.61m	£1,306.10m	£1,427.60m	£1,437.72m	£445.49m
Aesthetic and recreation (house prices)	£1,153.69m	£183.03m	£144.13m	£360.97m	£546.77m	£145.55m
Volunteering	£33.96m	£49.52m	£76.71m	£46.54m	£85.69m	£45.89m
Education	£1.99m	£0.89m	£1.16m	£4.65m	£4.01m	£0.80m
Total Asset Value	£28,079.1m	£12,368.0m	£15,791.4m	£17,462.5m	£18,702.7m	£6,760.0m
Total Monetary Flow (annual)	£932.0m	£412.5m	£528.9m	£581.5m	£623.9m	£226.3m

Figure 4: Relative contribution of each region to the total annual monetary flow of each ecosystem service (%)

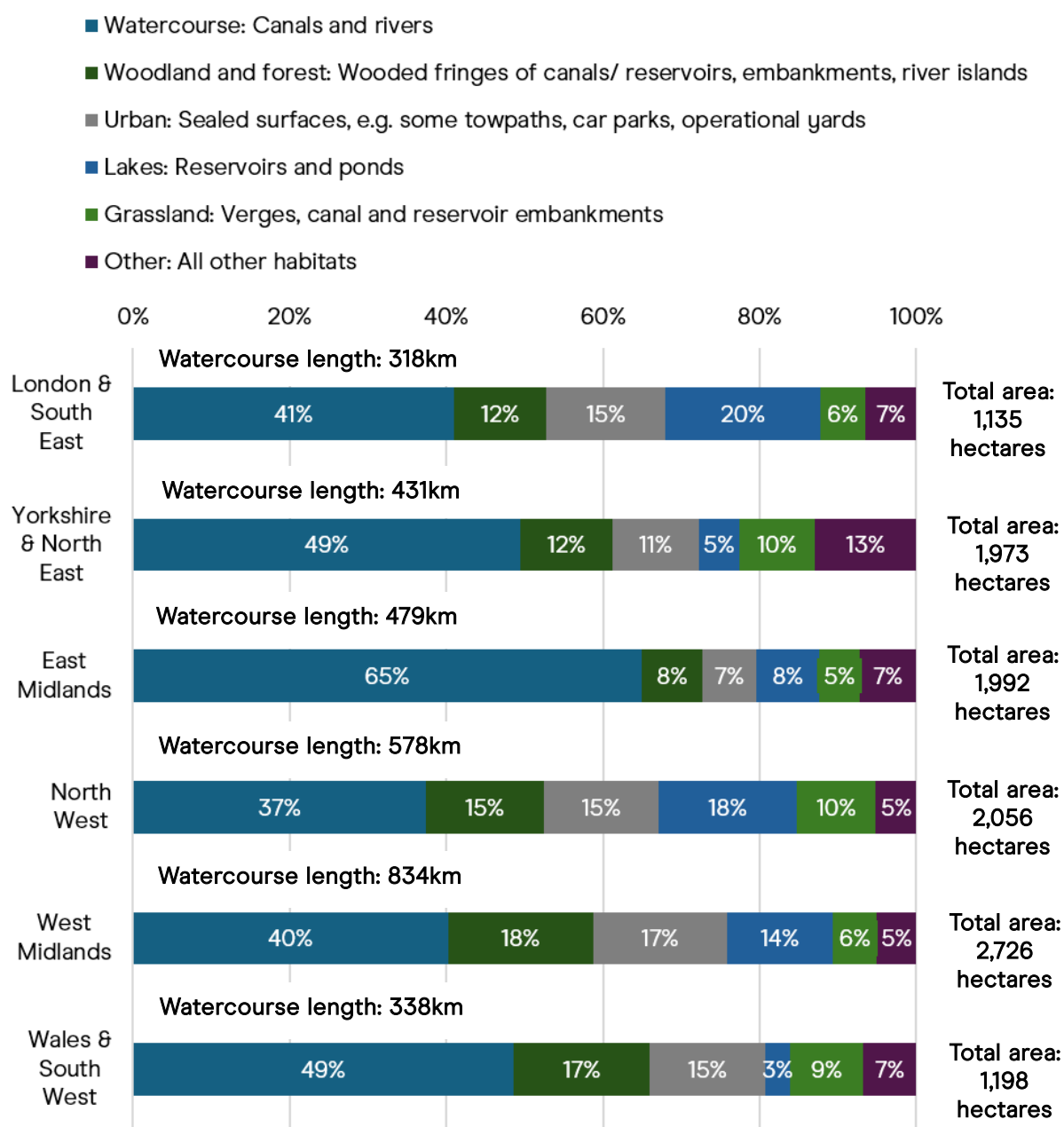


Asset Register

The West Midlands region contains the largest amount of natural capital assets (both by canal length and habitat area). The North West, East Midlands, and Yorkshire & North East regions contain the next largest amounts of natural capital assets, whilst the London & South East and Wales & South West regions contain the smallest quantities of natural capital assets.

The extent of broad habitat type varies across regions, as evidenced by London & South East containing a large proportion of lake (reservoirs and ponds) habitats (20%) compared with Wales & South West (3%). As different habitat types contribute to different ecosystem services, this results in some regions providing proportionately more or less of an ecosystem service relative to their overall size. Please see Figure 5.

Figure 5: Total habitat area (ha), total watercourse length (km) and proportion (%) of each habitat type by region



The condition of habitats varies significantly between Trust regions. In Yorkshire & North East, around 6% of land habitats are in 'Good' or 'Moderate' condition, whereas in the North West region, 40% are in 'Good' or 'Moderate' condition (see Figure 6).

The WFD ecological classification of canals shows that the average condition of waterbodies also differs significantly by region. The ecological condition of waterbodies is significantly higher in the West Midlands region and in the Yorkshire & North East region where 79% and 55% are in 'Good' ecological condition respectively. In contrast, only 6% of canals in the North West region and only 5% in the Wales & South West region are in 'Good' ecological condition (see Figure 7). Note, data for ecological condition is only available for England, Welsh waterbodies were not assessed for ecological condition.

Figure 6: Summary of condition of land habitats managed by the Trust in 2023, measured using the Defra Biodiversity metric

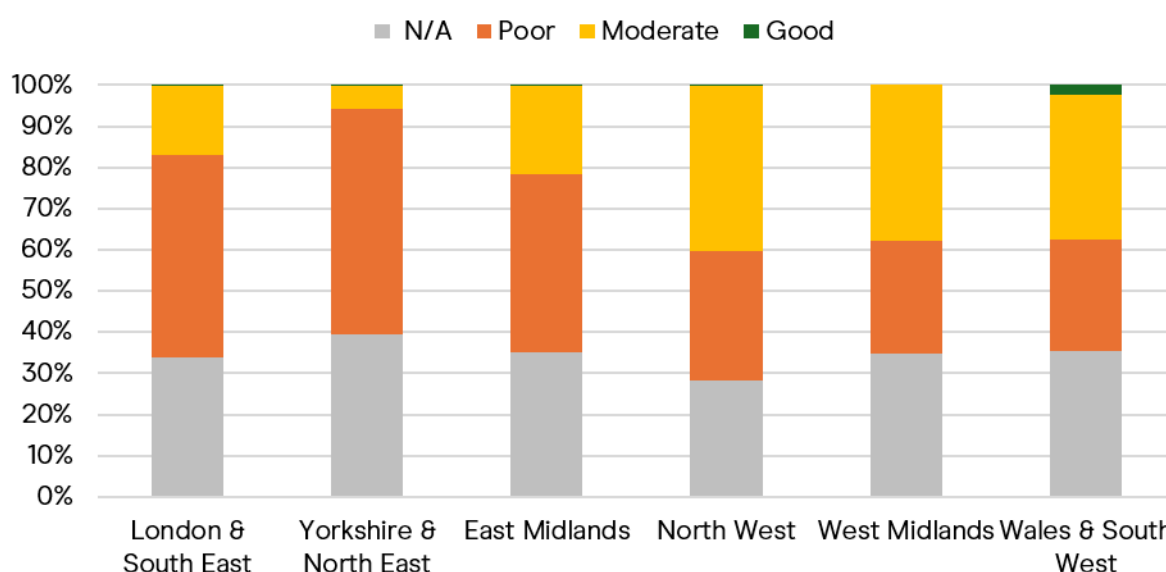
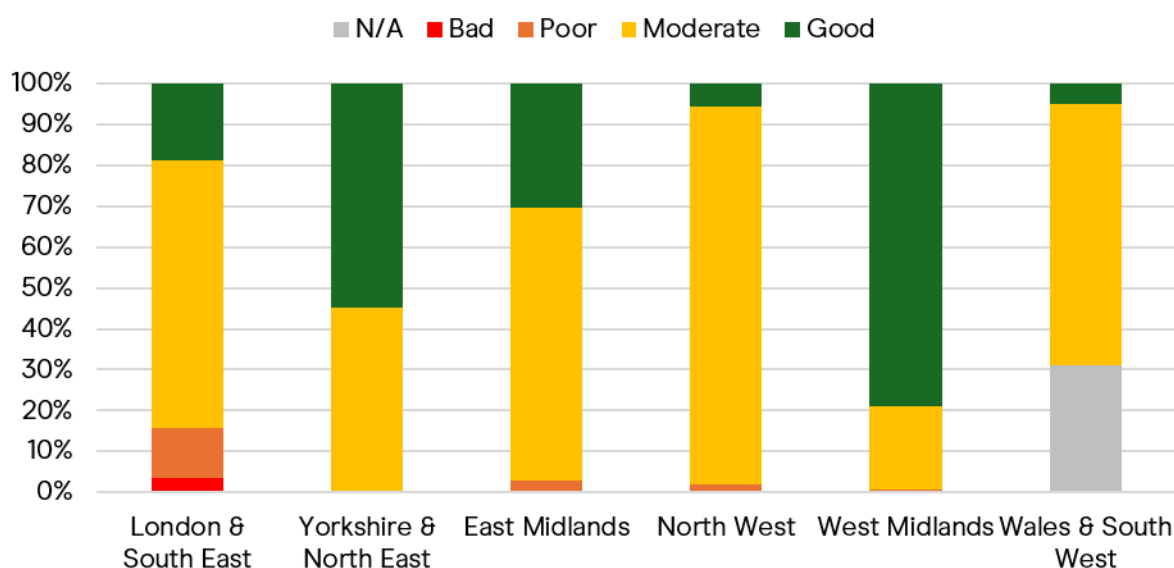


Figure 7: Summary of condition of watercourses managed by the Trust in 2023, measured using Water Framework Directive (WFD) Ecological Class.



References

- Canal & River Trust (2025). *The Vital Connector for Nature and People: The Role of our Canal Network in UK Nature Recovery and Connectedness*. Available at: <https://canalrivertrust.org.uk/our-cause/the-vital-connector-for-nature-and-people-report>
- CEFAS (2021). *Carbon stocks and accumulation analysis for Secretary of State (SoS) region: Cefas Project Report for Defra*, 42 pp. Available at: <https://randd.defra.gov.uk/ProjectDetails?ProjectId=20754>
- Costa, H., Floater, G., Hooyberghs, H., Verbeke, S. and De Ridder, K., (2016). *Climate change, heat stress and labour productivity: A cost methodology for city economies*. Centre for Climate Change Economics and Policy Working Paper No. 278. Grantham Research Institute on Climate Change and the Environment Working Paper No. 248. Available at: <https://www.cccep.ac.uk/wp-content/uploads/2016/07/Working-Paper-248-Costa-et-al.pdf>
- Defra (2023). *Enabling a Natural Capital Approach (ENCA)*. Available at: <https://www.gov.uk/guidance/enabling-a-natural-capital-approach-enca>
- DESNZ and BEIS (2024). *Traded carbon values used for modelling purposes, 2023*. Available at: <https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2023/traded-carbon-values-used-for-modelling-purposes-2023>
- Eftec (2018). *Scoping UK urban natural capital account - local climate regulation extension*. Available at: <https://randd.defra.gov.uk/ProjectDetails?ProjectID=20065&FromSearch=Y&Publisher=1&SearchText=urban>
- Ferrini, S., Reas, V., Bartolini, A., Ekins, P., and Grice, J. (2025). *Economic Methods for Water Ecosystem Services for SEEA EA*. ESCoE Discussion Paper No. 2025-06.
- Gibbons, S., Peng, C. & Tang, C.K. (2021). *Valuing the environmental benefits of canals and canal restoration using house prices*. Land Economics, 97(4), 858- 874. Available at: https://researchonline.lse.ac.uk/id/eprint/107931/1/Gibbons_Valuing_environmental_benefits_canals_2021.pdf
- HM Treasury (2026). *The Green Book: UK Government Guidance on Appraisal*. Available at: https://assets.publishing.service.gov.uk/media/698dbcd17da91680ad7f4308/The_Green_Book_2026.pdf
- Jones, L., Vieno, M., Morton, D., Hall, J., Carnell, E., Nemitz, E., Beck, R., Reis, S., Pritchard, N., Hayes, F., Mills, G., Cryle, P., Dickie, I., Koshy, A., Holland, M., (2017) *Developing estimates for the valuation of air pollution removal in ecosystem accounts. Final report for Office of National Statistics*. Wallingford, NERC/Centre for Ecology & Hydrology, 75pp. (CEH Project no. C06156) Available at: <https://nora.nerc.ac.uk/id/eprint/524081/>
- Lawton, R.N., Gramatki, I., Watt, W. et al. (2021). *Does Volunteering Make Us Happier, or Are Happier People More Likely to Volunteer? Addressing the Problem of Reverse Causality When Estimating the Wellbeing Impacts of Volunteering*. *J Happiness Stud* **22**, 599–624.
- Mourato, S., Atkinson, G., Collins, M., Gibbons, S., MacKerron, G., and Resende, G. (2010). *Economic Analysis of Cultural Services*. Available at: <https://www.cbd.int/financial/values/unitedkingdom-culturalvalues.pdf>
- Murphy, J.M., Sexton, D.M.H., Jenkins, G.J., Boorman, P.M., Booth, B.B.B., Brown, C.C., Clark, R.T., Collins, M., Harris, G.R., Kendon, E.J., Betts, R.A., Brown, S.J., Howard, T. P., Humphrey, K. A., McCarthy, M. P., McDonald, R. E., Stephens, A., Wallace, C., Warren, R., Wilby, R., Wood, R. A. (2009), *UK Climate Projections Science Report: Climate change projections*. Met Office Hadley Centre, Exeter.
- Natural Capital Committee (2015). *Developing Corporate Natural Capital Accounts: Final Report*. Available at: <https://www.gov.uk/government/publications/natural-capital-committee-research-corporate-natural-capital-accounting>
- Natural England (2021). *Carbon storage and sequestration by habitat: a review of the evidence (second edition)*. Natural England Research Report NERR094. Natural England, York. Available at:

<https://publications.naturalengland.org.uk/publication/5419124441481216#:~:text=This%20Natural%20England%20Research%20Report,their%20condition%20and%20For%20management>

Office for National Statistics (ONS) (2017a). *Principles of Natural Capital Accounting*. Available at: <https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/principlesofnaturalcapitalaccounting>

Office for National Statistics (ONS) (2017b). *Changes in the value and division of unpaid volunteering in the UK: 2000 to 2015*. Available at: <https://www.ons.gov.uk/economy/nationalaccounts/satelliteaccounts/articles/changesinthevalueanddivisionofunpaidcareworkintheuk/2015#time-and-participation-in-formal-volunteering-in-the-uk-between-2000-and-2015>

Office for National Statistics (ONS) (2023). *Urban natural capital accounts, UK: 2023*. Available at: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/urbannaturalcapitalaccountsuk/2023>

Office for National Statistics (ONS) (2024). *UK natural capital accounts: 2024*. Available at: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapitalaccounts/2024>

ORVal (2018). *Outdoor Recreation Valuation (ORVal) User Guide: Version 2.0*. Land, Environment, Economics and Policy (LEEP) Institute, Business School, University of Exeter. Available at: <https://www.leep.exeter.ac.uk/orval/>

United Nations (UN), European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, & World Bank. (2025). *System of National Accounts 2025: Pre-edit version*. Available at: <https://unstats.un.org/unsd/nationalaccount/sna25.asp>

University of Manchester (2019). *Canals, Cooling and Replicable Models - Summary Report to the Canal and River Trust*. Available at: <https://documents.manchester.ac.uk/display.aspx?DocID=57300>

White, M.P., Elliott, L.R., Taylor, T., Wheeler, B.W., Spencer, A., Bone, A., Depledge, M.H., Fleming, L.E. (2016). *Recreational physical activity in natural environments and implications for health: A population-based cross-sectional study in England*. *Preventive Medicine* 91, 383–388.

Appendix 1: Summary of Methodology by Ecosystem Service

Table 3: Summary of methodology by ecosystem service

Ecosystem Service	Physical Flow	Confidence (Physical)	Valuation Method	Confidence (Monetary)	Evidence Source	Discount Rate	Asset Value Assumptions
Provisioning Services							
Renewable energy provisioning	Average annual MWh energy provided	M	Resource rent, £/kWh	M	ONS (2024) resource rent, Trust data	Standard: 3.5%, declining after 30 years	Renewable energy provision remains constant over 100-year period
Water provisioning	Volume of water transfer, m3 per year	M	Resource rent, £/m3	M	ONS (2024) resource rent, Trust data	Standard: 3.5%, declining after 30 years	Water transfer agreements remain constant over 100-year period
Regulating Services							
Air pollution regulating	Tonnes air pollutant emissions removed per hectare by habitat type	M	Avoided health damage cost, £ per tonne by pollutant	M	Jones et al. (2017) (re-published 2019), ONS (2024)	Health: 1.5%, declining after 30 years	Constant real value of pollutant removed per hectare over time
Greenhouse gas regulating	Net carbon sequestration by habitat type, tCO2e/ha	M	Cost-based approach, marginal abatement cost to meet the UK net zero target by 2050, £/tCO2e	H	Evidence from ENCA 3.1 (2024): Natural England (2021), CEFAS (2021), ONS (2023), DESNZ and BEIS (2024)	Standard: 3.5%, declining after 30 years	Increasing non-traded cost of carbon over time
Urban heat regulating	N/A	M	Avoided loss in labour productivity, £ saving due to urban cooling effect of canals	L	Efttec (2018), ONS (2024), University of Manchester (2019), Costa et al., (2016), Murphy et al., (2009)	Standard: 3.5%, declining after 30 years	Increasing temperatures in line with UKCP09, GVA uplift of 2% annually, decreasing to 1.5% for years 31 – 75, and 1% for years 76 – 100

Ecosystem Service	Physical Flow	Confidence (Physical)	Valuation Method	Confidence (Monetary)	Evidence Source	Discount Rate	Asset Value Assumptions
Cultural Ecosystem Services							
Recreation (enjoyment benefits)	Number of unique visits per year ⁴	M	Travel costs (ORVal)	M	ORVal (2018)	Standard: 3.5%, declining after 30 years	Visits remain constant over time
Recreation (health cost savings)	Number of active visits per year ⁵	M	Avoided NHS health costs, £ per active visit	M	White et al., (2016)	Standard: 3.5%, declining after 30 years	Active visits remain constant over the 100-year period
Tourism	Domestic visits per year that are 3+ hours long ⁶	M	Travel costs (ORVal)	M	ORVal (2018)	Standard: 3.5%, declining after 30 years	Domestic tourism visits remain constant over the 100-year period
Aesthetic and recreation (house prices)	Number of households living within 100m of a canal	H	Hedonic pricing, house price premium, £ per household	M	Gibbons et al. (2021)	Standard: 3.5%, declining after 30 years	Number of houses within 100m of a canal remains constant. Aggregate price premiums are annualised over a 60-year period to estimate equivalent annual flows.
Volunteering	Number of volunteer hours	H	Replacement wage approach	H	ONS (2017b), Lawton et al. (2021)	Standard: 3.5%, declining after 30 years	Volunteer hours / number of volunteers remain constant over the 100-year period
Education	Number of participant hours per year	M	Travel cost method, £ per pupil hour	M	Mourato (2010)	Standard: 3.5%, declining after 30 years	Education programme continues at current scale over the 100-year period

⁴ Excludes active visits, visits >3 hours, visits from volunteers, and visits from those living within 100m to ensure there is no double counting between cultural ecosystem services

⁵ Excludes visits from volunteers, and visits from those living within 100m to ensure there is no double counting between cultural ecosystem services.

⁶ Excludes active visits, visits from volunteers, and visits from those living within 100m to ensure there is no double counting between cultural ecosystem services.

Appendix 2: Accessible Figure Descriptions

Figure 1: Summary of breakdown of total natural capital asset value by ecosystem service in 2023.

Figure 2 shows how the total natural capital asset value is split by major ecosystem services. From smallest to largest, they are: Recreation (45%), Physical health (36%), Tourism (8%), Water supply (6%) and Other (4%).

Figure 2: Summary of extent of habitats managed by the Trust in 2023.

Figure 2 shows the composition of the 11,079 hectares of habitat managed by the Trust in 2023.

Watercourses, comprising canals and rivers, account for 47% of the total area and are the largest habitat category. Woodland and forest account for 14%, urban habitats and sealed surfaces for 13%, lakes including reservoirs and ponds for 11%, grassland for 8%, and all other habitats for 7%. The Trust also manages 2,977 kilometres of watercourses.

Figure 3: Summary of condition of natural assets managed by the Trust in 2023. For Habitats this is measured using the Defra Biodiversity metric. For Watercourses this is measured using Water Framework Directive (WFD) Ecological Class.

Figure 3 compares the condition of land habitats and watercourses managed by the Trust in 2023. Land habitat condition is assessed using the Defra Biodiversity Metric. Of the land habitat area, less than 1% is in good condition, 28% is in moderate condition and 37% is in poor condition. The remaining 34% does not have a condition assessment, predominantly because it consists of urban, cropland and other habitat types for which a condition score is not applicable or available.

Watercourse condition is based on Water Framework Directive ecological classifications. Of the Trust-managed watercourses, 39% are in good ecological condition, 55% are in moderate condition, 2% are in poor condition and less than 1% are in bad condition. The remaining 4% do not have a Water Framework Directive ecological classification. The two bars therefore use different assessment frameworks and should not be treated as directly equivalent measures of condition.

Figure 4: Relative contribution of each region to the total annual monetary flow of each ecosystem service (%)

Figure 4 shows the proportion of the Trust-wide annual monetary value of each ecosystem service contributed by the six Trust regions. It presents relative shares rather than the absolute monetary value of each service.

London & South East provides around half of renewable-energy provisioning value and close to four-fifths of water-provisioning value. Wales & South West and the West Midlands provide the remaining water-provisioning value, while Yorkshire & North East, the East Midlands and the North West do not contribute to this service under the water-transfer agreements included in the baseline.

London & South East also makes the largest contribution to urban heat regulation, reflecting the extent of the canal network in densely populated urban areas and the number of workers potentially benefiting from canal cooling. Contributions to recreation, physical-health benefits and tourism are more widely distributed across the six regions.

The West Midlands makes the largest contribution to air-pollution regulation and greenhouse-gas regulation. London & South East makes the largest contribution to aesthetic and recreation benefits reflected in house prices. The North West and West Midlands make relatively large contributions to education, while volunteering value is distributed across all six regions. These differences reflect the regions' habitat composition, population, visitor numbers, economic characteristics and the location of relevant activities and agreements.

Figure 5: Total habitat area (ha), total watercourse length (km) and proportion (%) of each habitat type by region

Figure 5 compares the percentage composition of six broad habitat categories in each Trust region: watercourses; woodland and forest; urban sealed surfaces; lakes; grassland; and other habitats.

Watercourses are the largest habitat category in every region. They account for 65% of habitat in the East Midlands, 49% in Yorkshire & North East and Wales & South West, 41% in London & South East, 40% in the West Midlands, and 37% in the North West.

London & South East contains 12% woodland and forest, 15% urban habitat, 20% lakes, 6% grassland and 7% other habitats. It has the largest proportion of lakes among the regions.

Yorkshire & North East contains 12% woodland and forest, 11% urban habitat, 5% lakes, 10% grassland and 13% other habitats. It has the largest proportion of other habitats.

The East Midlands contains 8% woodland and forest, 7% urban habitat, 8% lakes, 5% grassland and 7% other habitats. Its habitat composition is the most dominated by watercourses.

The North West has the most evenly distributed habitat composition: 15% woodland and forest, 15% urban habitat, 18% lakes, 10% grassland and 5% other habitats, in addition to its 37% watercourse share.

The West Midlands contains 18% woodland and forest, 17% urban habitat, 14% lakes, 6% grassland and 5% other habitats. It has the largest woodland and forest share and the largest urban share.

Wales & South West contains 17% woodland and forest, 15% urban habitat, 3% lakes, 9% grassland and 7% other habitats. It has the smallest proportion of lakes.

Total habitat area and watercourse length also vary by region. London & South East has 1,135 hectares and 318 kilometres of watercourses; Yorkshire & North East has 1,973 hectares and 431 kilometres; the East Midlands has 1,992 hectares and 479 kilometres; the North West has 2,056 hectares and 578 kilometres; the West Midlands has 2,726 hectares and 834 kilometres; and Wales & South West has 1,198 hectares and 338 kilometres. Percentages may not sum to exactly 100% because of rounding.

Figure 6: Summary of condition of land habitats managed by the Trust in 2023, measured using the Defra Biodiversity metric

Figure 6 compares the condition of land habitats managed by the Trust across its six regions, using the Defra Biodiversity Metric. Each bar divides regional habitat area into good, moderate and poor condition, together with habitat for which condition is not assessed or not applicable.

Very little land habitat is classified as being in good condition in any region. Wales & South West has the most visible good-condition share, at approximately 2%, while good condition accounts for less than 1% in the other regions.

The North West has the highest combined proportion of land habitat in good or moderate condition, at around 40%. It is followed by the West Midlands and Wales & South West, both at just under 40%. The East Midlands has a little over one-fifth of habitat in moderate condition, while London & South East has approximately one-sixth. Yorkshire & North East has the lowest combined proportion in good or moderate condition, at around 6%.

Poor-condition habitat accounts for more than half of assessed and unassessed habitat combined in London & South East and Yorkshire & North East, and more than two-fifths in the East Midlands. The proportion without a condition assessment ranges from approximately 28% in the North West to approximately 39% in Yorkshire & North East. The unassessed category predominantly covers urban, cropland and other habitat types.

Figure 7: Summary of condition of watercourses managed by the Trust in 2023, measured using Water Framework Directive (WFD) Ecological Class.

Figure 7 compares the ecological condition of Trust-managed watercourses across the six regions using Water Framework Directive classifications. Watercourses are divided into good, moderate, poor and bad condition, together with watercourses for which no classification is available.

The West Midlands has the largest proportion of watercourses in good ecological condition, at approximately 79%. Yorkshire & North East follows at approximately 55%. Around 30% of watercourses are in good condition in the East Midlands and around 20% in London & South East.

The North West has approximately 6% of watercourses in good condition, with around 93% classified as moderate. Wales & South West has approximately 5% in good condition and around 64% in moderate condition. However, approximately 31% of watercourses in Wales & South West are unclassified because Water Framework Directive ecological-condition data were not available for the relevant Welsh waterbodies.

Poor or bad condition represents a relatively small share in the English regions. London & South East has the largest visible combined poor and bad share, at approximately 15%. The East Midlands and North West have much smaller poor or bad shares, and no poor or bad share is shown for Yorkshire & North East or the West Midlands. Comparisons involving Wales & South West should be treated cautiously because of the substantial unclassified proportion.



Canal & River Trust

For any queries, please contact Brenda Dorpalen (Insights and Economics Team Manager) at Brenda.Dorpalen@canalrivertrust.org.uk



canalrivertrust.org.uk

Registered charity no. 1146792